Discussion of Amendments to Claims

The preamble of all of the claims has been amended to remove the "consisting of" language and replace it with "consisting essentially of" language. Further, various amendments have been made to the claims in response to the objections of the Examiner. In addition, the generic alkali metal promoter, which had been claimed in Claims 13 and 24, has been limited to sodium and potassium oxide, thereby eliminating cesium as a potential alkali metal promoter for the composition of the invention. Minor amendments have also been made to the quantities of the components in several of the claims. Various claims also have been cancelled, either because they would have added additional subject matter to the independent claim, and therefore would not have been proper dependent claims under an independent claim containing the "consisting essentially of" language, or merely to reduce the overall number of claims.

No new subject matter is introduced by any of these amendments.

Discussion of the Claim Rejections

Claim Objections

The USPTO rejected various claims based on certain claim informalities. The applicants have amended those claims in the manner suggested by the Examiner.

Double Patenting

The USPTO rejected the claims of the application based on obviousness-type double patenting citing two copending applications. The USPTO asserted that a previously filed Terminal Disclaimer was incomplete, as it did not mention the assignee's name. A proper Terminal Disclaimer is attached, as Exhibit A.

Claim Rejection

The USPTO rejected Claims 1 - 2, 7, 9 - 10 and 12 - 14 under 35 USC §103 as being unpatentable over Zimmerman, et. al., U.S. Patent No. 5,378,350, taken together with Kerby, et. al., U.S. Patent No. 5,258,567. In addition, the USPTO rejected Claims 3 - 6, 8, 11 and 15 - 27 under 35 USC §103 as being unpatentable over Zimmerman, et. al. taken togther with Kerby, et. al. and further in view of Hamner, U.S. Patent No. 4,212,771. The applicants believe that the amended claims overcome these rejections.

The applicants have discovered a new dehydrogenation catalyst, which is particularly useful for vapor phase dehydrogenation. The

catalyst comprises chromium oxide on an alumina carrier with at least two promoters, zirconium and magnesium, and preferably an alkali promoter, selected from sodium and potassium, preferably sodium. The applicants have surprisingly discovered that there is a symbiotic relationship when both zirconium and magnesium are added as promoters to this catalyst. By adding both magnesium and zirconium as promoters, the resulting catalyst exhibits higher selectivity and higher olefin yield after aging than comparative catalysts that merely contained alumina, chromium, an alkali metal and either, but not both of, magnesium or zirconium. (See Table 1, page 20 of the application.) This was a surprising result.

In the Office Action of the United States Patent and Trademark Office dated March 7, 2005, the USPTO failed to accept previous arguments concerning distinctions between the claims of the application and the references cited by the USPTO. In order to overcome the rejections by the USPTO and to place the application in condition for allowance, the applicants have amended all claims of the application by introducing "consisting essentially of" language into the preamble of all claims, rather than utilizing "comprising" language. By this Amendment the applicants believe that they have overcome the substantive rejections cited in the Office Action.

Zimmerman, et. al.

This is the primary reference cited by the United States Patent and Trademark Office. This reference discloses a dehydrogenation catalyst comprised of an alumina carrier onto which chromium and a zirconium metal compound have been added. Further, as acknowledged by the Examiner on page 5 of the Office Action, Zimmerman, et. al. also requires the presence of "at least one cesium metal compound promoter in an amount of 0.1 to 10% by weight of the catalyst, calculated as Cs_2O...". (Office Action, page 5, line 4 - 6.) This requirement for cesium to be present in this catalyst is further discussed at lines 10 - 11 of page 5 of this Office Action. In the claims, as now filed with the "consisting essentially of" language, cesium has been eliminated as a potential component of the claimed catalyst, thereby eliminating Zimmerman as a reference that can be cited against the application.

With regard to all claims depending on independent Claims 1 and 15, no alkali metal is a component of the catalyst. With regard to the remaining claims of the application, the alkali metal that is a component of the catalyst is limited to sodium and potassium, preferably sodium and not cesium.

The preference for cesium over any other alkali metal is clear from the disclosures in Zimmerman, et. al.

> Further, it can be seen from table I that cesium compounds, in comparison with the other alkalis and alkaline earths, prevent the coke formation most effectively. (Col. 6, lines 50 - 52.) See also Col. 2,

lines 16 - 20.

Note also that the performance of catalysts containing cesium in the Examples VII - XVI of Zimmerman, et. al. is better than those where sodium, potassium, calcium or barium are utilized. Accordingly, it is clear that Zimmerman, et. al. teaches that the addition of cesium to the catalyst is a requirement for an effective catalyst.

In addition, Zimmerman, et. al. fail to disclose that an alkali metal, including cesium, would perform better on their catalyst if combined with an alkaline earth metal, particularly magnesium. In fact, there is no suggestion of utilizing magnesium as a promoter in Zimmerman, et. al. at all. Further, even the alkaline earth metals that are disclosed in Examples of Zimmerman, et. al., i.e., calcium and barium, fail to perform as well as cesium. Thus, a person skilled in the art reviewing Zimmerman, et. al. would not be taught to utilize magnesium and would not be taught to combine an alkali metal, specifically sodium or potassium, with magnesium to assist in the promotion of the activity of a dehydrogenation catalyst containing chromium and zirconium.

Accordingly, the applicants respectfully assert that Zimmerman, et. al. fail to disclose the invention as now claimed and in fact they teach away from the invention, as now claimed, by requiring the utilization of cesium as the critical component of

their catalyst and by failing even to mention the use of magnesium as a required component of the catalyst.

Kerby, et. al.

Kerby, et. al. fail to provide any assistance to the teaching of Zimmerman, et. al. Kerby, et. al. disclose a dehydrogenation catalyst with a vastly different composition from that claimed by the applicants comprising mica, an active metal selected from the group consisting of Pt, Cr, Pd, Ir, Rd and mixtures thereof, and a modifier metal selected from the group Sn and Ga. To this catalyst Kerby, et. al. suggest that a second modifier, selected from the group consisting of alkali metals, alkaline earth metals and rare earth elements, be added. Clearly nothing in Kerby, et. al. would assist Zimmerman, et. al. in teaching the invention, as claimed. In fact, Kerby, et. al. teach away from the composition as now claimed based on the "consisting essentially of" language.

Hamner

Hamner fails to add to the teaching of Zimmerman, et. al. and Kerby, et. al. as Hamner was merely cited to disclose the composition of the catalyst carrier. Hamner, thus provides no teaching as to the desirability of any particular promoter for use with the dehydrogenation catalyst.

The applicants respectfully assert that the claim of *prima facie obvious* under 35 USC §103 has been overcame by the amendments to the claims.

CONCLUSION

The applicants respectfully assert that the claims, as amended, are now allowable over the references cited and request the issuance of a Notice of Allowability. If there are any questions concerning this matter, please contact applicants' counsel.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that this correspondence is being deposited with the United States Postal Service in an envelope as Express Mail Post Office to Addressee," mailing Label Number ED 293226194US, envelope addressed to Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Dated: June 6, 2005 Janice Coffman
Janice Coffman

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